Wide Bandgap Semiconductor Based Solid State Smart Circuit Protection, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Advanced solid state power component technology is necessary for future hybrid aircraft systems with increased power demands. There is a need for adequate circuit protection in these high powered electrical systems to achieve safety, reliability, and ultimately airworthiness. Solid State Power Controller (SSPC) modules already exist for aircraft applications but they were developed for the lower power levels seen in existing aircraft branch circuits. Hybrid-Electric aircraft have electrical power levels that are one or two orders of magnitude higher than existing aircraft and the presently existing SSPCs are simply not appropriate for use in these vehicles. SSPCs at the power levels required for a GA aircraft propulsion motor hardly exist; and SSPCs at the power levels required by small electric UAVs are too heavy and bulky. The LaunchPoint SSPC unit will incorporate all of the capabilities of existing SSPCs but with a few distinctions. LaunchPoint's SSPC will utilize Silicon Carbide and Gallium Nitride semiconductors to create SSPCs that are not only significantly smaller but can operate at much higher power levels. In addition to utilizing a different MOSFET element, the LaunchPoint SSPC would incorporate a microcontroller that would perform high bandwidth monitoring of current and voltage waveforms and derive low bandwidth metrics that can be reported back to the system Hybrid Power Controller. These metrics could include transient peak currents and voltages, RMS currents and voltages, and frequency content. In addition to these metrics, LaunchPoint would like to evaluate the feasibility of using the smart SSPC to detect imminent insulation failures resulting from coronal discharge, a particularly troubling problem associated with high altitude flight. This could be accomplished by real time analysis of partial discharge currents and other characteristic phenomena. These advancements represent a novel contribution to electric aircraft propulsion systems.

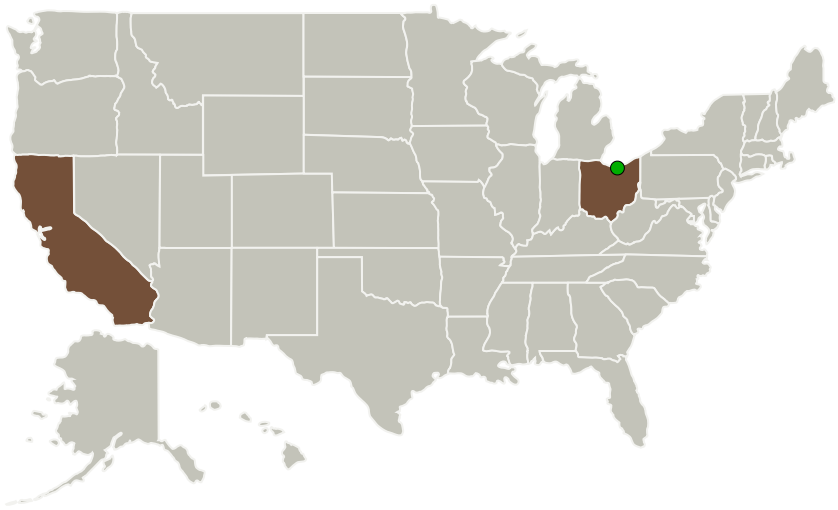
Wide Bandgap Semiconductor Based Solid State Smart Circuit Protection, Phase I Briefing Chart Image

Table of Contents

Wide Bandgap Semiconductor Based Solid State Smart Circuit Protection, Phase I

Completed Technology Project (2017 - 2017)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
LaunchPoint Technologies, Inc.	Lead Organization	Industry	Goleta, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

LaunchPoint Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

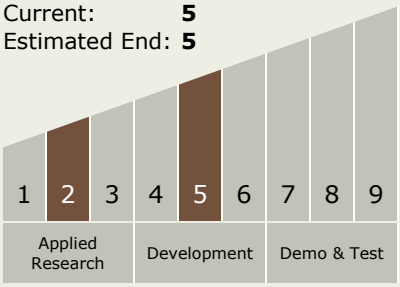
Carlos Torrez

Principal Investigator:

Michael Ricci

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Wide Bandgap Semiconductor Based Solid State Smart Circuit Protection, Phase I

Completed Technology Project (2017 - 2017)

Images

Briefing Chart Image
Wide Bandgap Semiconductor Based Solid State Smart Circuit Protection, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/127310)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.9 Hybrid Electric Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System